MACHEREY-NAGEL

NucleoMag® DNA Food

Automated purification of DNA from food and feed samples on the Freedom EVO® 150 platform

Introduction

Raising challenges of global agriculture and food production comes along with increased incorporation of genetically modified organisms (GMOs) in food and feed samples (1). Moreover, the increasing demand for reliable detection of foodborne pathogens, food adulterations (2) or allergens (3) requires tailored and optimized analytical methods.

One common issue during DNA isolation from food and feed samples is the vast diversity in terms of consistency and composition. Many food samples are heterogeneous and contain a variety of different components, like lipids, polysaccharides and high content of proteins. During DNA extraction, these compounds are released and interferences during subsequent biomolecular applications have a strong impact by, e.g., interaction with nucleic acids or disturbing DNA polymerase activity. Furthermore, processed and complex food matrices often exhibit a very low and degraded DNA content. To circumvent these sample matrix based obstacles, MACHEREY-NAGEL developed the NucleoMag® DNA Food kit, allowing rapid and reliable purification of genomic DNA from food and feed in an automation friendly and flexible format for 1–96 samples.

This application note describes the automated processing of the NucleoMag® DNA Food Kit from MACHEREY-NAGEL on the TECAN Freedom EVO® liquid handling workstation using the Te-Shake™ in combination with the NucleoMag® SEP magnetic seperator for 96-well plate processing. We show the automated workflow for genomic DNA purification from various food sample material such as raw meat, seeds, or processed food such as pasta and dry dog food. The tailored protocol allows the processing of up to 96 samples per run (variable sample number).

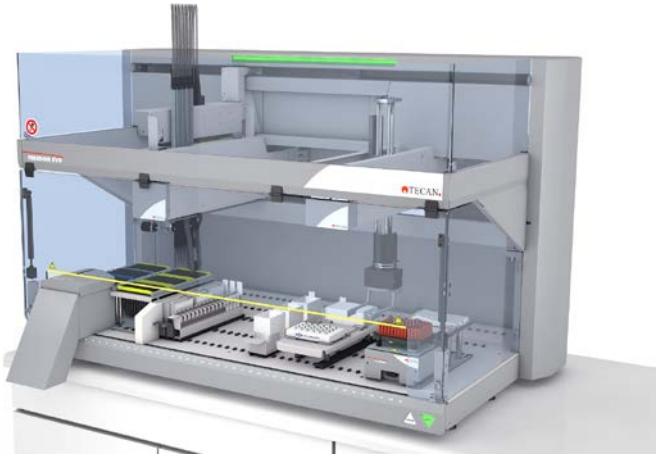
Product at a glance

NucleoMag® DNA Food	
Technology	Magnetic beads
Sample material	≤ 200 mg food or feed
Typical yield	0.1–10 µg, depending on sample quality
Elution volume	50–200 µL

Freedom EVO®	
Technology	8-channel LiHa Arm configured for disposable tips, 1000 µl syringes (alternative: AirLiHa Arm), RoMa Arm for plate handling, Te-Shake™ for heating (RT-80°C) and shaking (100–1500 rpm)
Capacity	1–96 samples per batch
Special features	TouchTools™ software for intuitive touch screen guided operation, reduces training needs, optional integration of an Infinite® F or M NANO+ reader (Configurations of the Infinite 200 PRO family), in combination with the Freedom EVOware® Normalization Wizard, allowing for automated quantification and normalization

Material and methods

Samples from up to 200 mg food or feed are lysed with Buffer CF and Liquid Proteinase K for 30 minutes at 65 °C. Depending on the sample type lysis conditions, like buffer volume and incubation time, might change (please see the NucleoMag® DNA Food kit manual for more detailed information). After centrifugation the cleared lysate is transferred to a square-well block for further processing. Subsequent DNA isolation is performed on the automation platform Freedom EVO®. The isolation principle is based on reversible adsorption of nucleic acids to paramagnetic beads under appropriate buffer conditions.

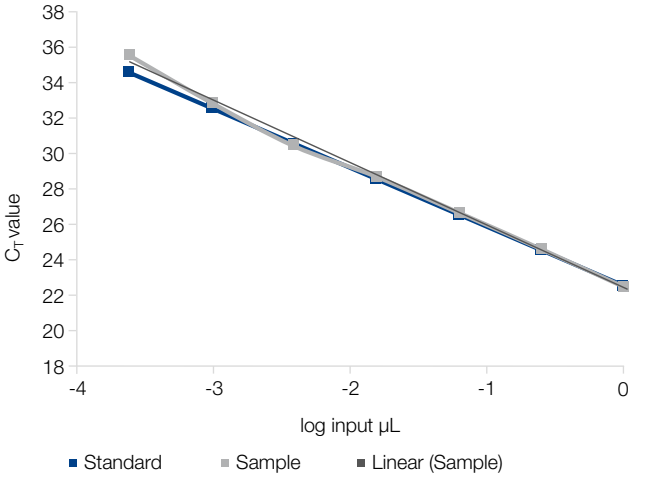


Example configuration on a Freedom EVO® 150

Application data

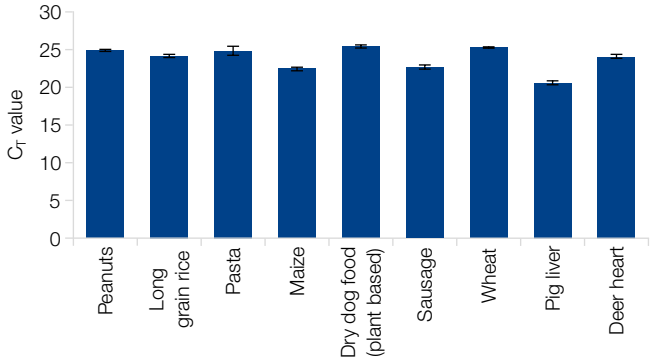
Purity of isolated DNA from food and feed samples

DNA was isolated from different food and feed samples (n = 4) using the NucleoMag® DNA Food kit on the Freedom EVO® 150 platform. Starting material was 50 mg/prep for rice or wheat, and 25 mg/prep for pig liver. The purity was determined by measuring A_{260}/A_{280} (blue bars) and A_{260}/A_{230} (orange squares) values via UV spectrometry.



qPCR performance analysis of purified nucleic acids from sausage samples

DNA was isolated from 50 mg of sausage samples using the NucleoMag® DNA Food kit on a Freedom EVO® 150 platform and subjected to a subsequent qPCR analysis using dilution series of the eluate (1:4 serial dilution). The qPCR was performed for a 103 bp actin amplicon using the SensiFast™ Probe Lo-ROX kit from BioLine on an Applied Biosystems® 7500 Real-Time PCR System. The logarithms of the calculated eluate input volumes were plotted against the C_T values (Sample - grey line) in comparison to a theoretical standard curve (standard - blue line) and the regression curve (linear sample - black line). The slope of the regression curve (-3.5246) and the calculated qPCR-efficiency (approx. 92,18 %) show an excellent qPCR-performance without PCR inhibition.



qPCR analysis of purified DNA from various food and feed samples

DNA was isolated from different food and feed samples (n = 4) including raw meat, seeds, or processed food (blue bars) using the NucleoMag® DNA Food kit the Freedom EVO 150 platform. A subsequent qPCR analysis was performed for a 103 bp actin amplicon using the SensiFast™ Probe Lo-ROX kit from BioLine on an Applied Biosystems® 7500 Real-Time PCR System.

Automate your genomic DNA extraction from food and feed samples

MACHEREY-NAGEL and TECAN deliver a tailored solution for your high throughput DNA extraction from food and feed sample material.

We adapted the NucleoMag® DNA Food procedure on the Freedom EVO® 150 system to automate your nucleic acid purification workflow.

- Reliable performance and excellent DNA yields for e.g., species identification and GMO detection
- Excellent recovery from diverse and challenging food matrices
- Tailored protocol for processing variable sample numbers

References

(1) Grazina et al., 2017 “Tracing two Roundup Ready™ soybean lines (GTS 40-3-2 and MON89788) in foods commercialised in Portugal”. Food Control

(2) Sobrino-Gregorio et al., 2019 ”Detection of honey adulteration by conventional and real-time PCR”. Food Control

(3) Garino et al., 2016 ”Sensitive and specific detection of pine nut (Pinus spp.) by real-time PCR in complex food products”. Food Chemistry

Ordering information

Product	Specifications	Pack of	REF
NucleoMag® DNA Food	Kit based on magnetic bead technology for the isolation of genomic DNA from food and feed samples including NucleoMag® B-Beads, buffers, Liquid Proteinase K	1 x 96 / 4 x 96	744945.1 / .4
NucleoMag® SEP	Static magnetic separator	1	744900
Square-well Block	96-well deep-well block with 2.5 mL square-wells, u-bottom for magnetic separation	4 / 24	740481 / .24
Elution plate U-bottom	96-well microplate with 300 µL u-bottom, including self adhering foil	24	740486.24